

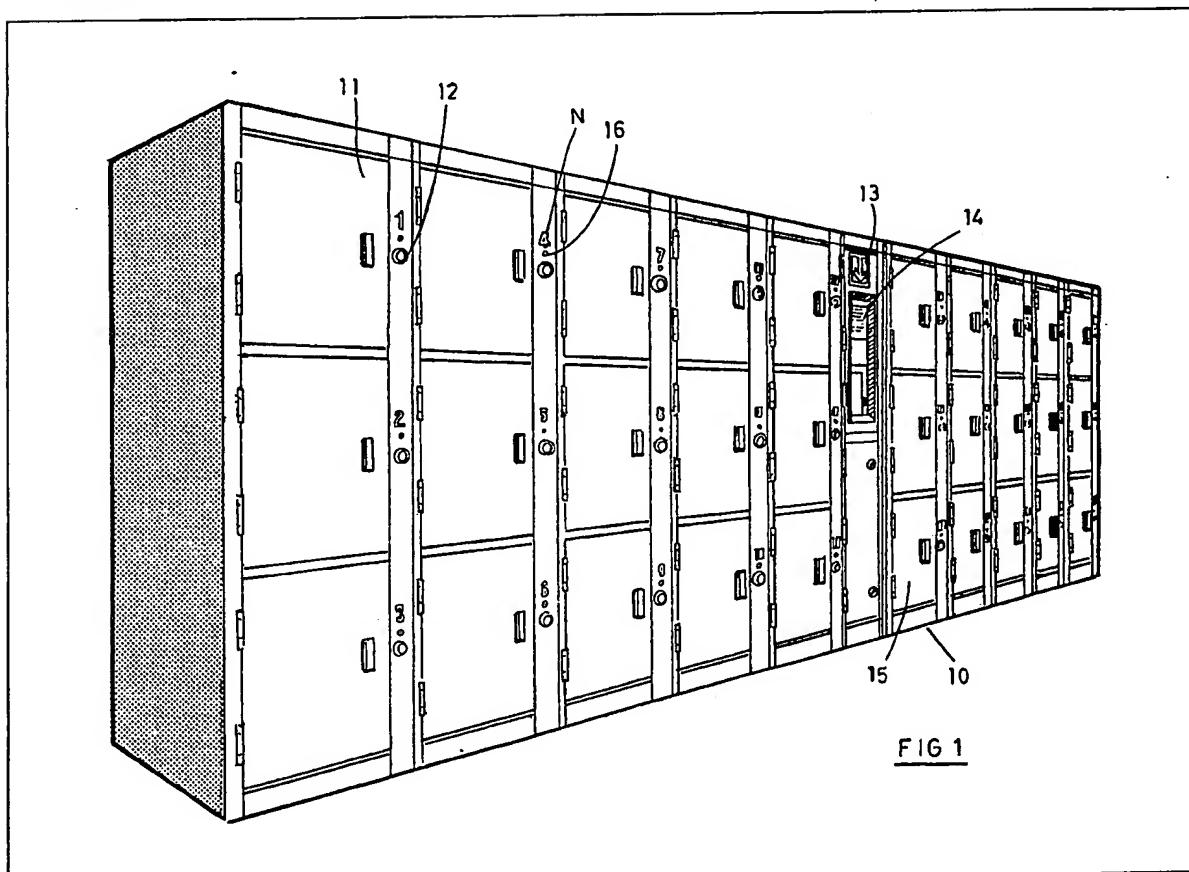
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(54) **Lock system for storage units**

(57) The present invention relates to a locker system (10) comprising a set of lockers (11) which are centrally controlled by a computer. According to the invention the computer upon payment of a prescribed fee chooses a free locker which is indicated to the user and can then be opened by pushing the corresponding button (12). When the user has stored his luggage and closed the door of the corresponding locker he once again pushes the button (12), which locks the locker. Instead of a key the user receives a plastic card with a magnetic strip containing the necessary data for opening the locker when the user returns. In this way only one coin insert and only one card insert in a central control panel (14) are necessary.



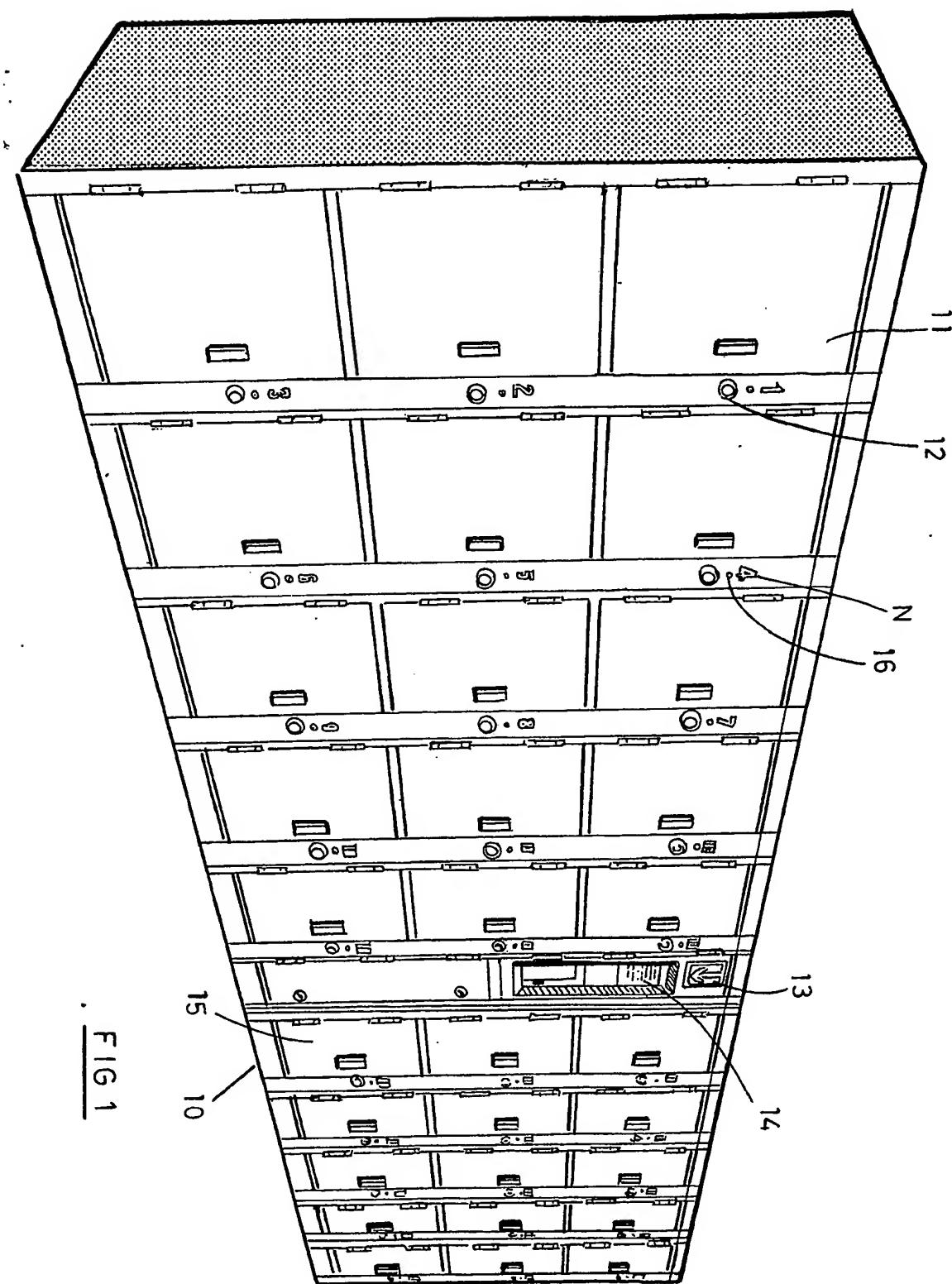


FIG 1

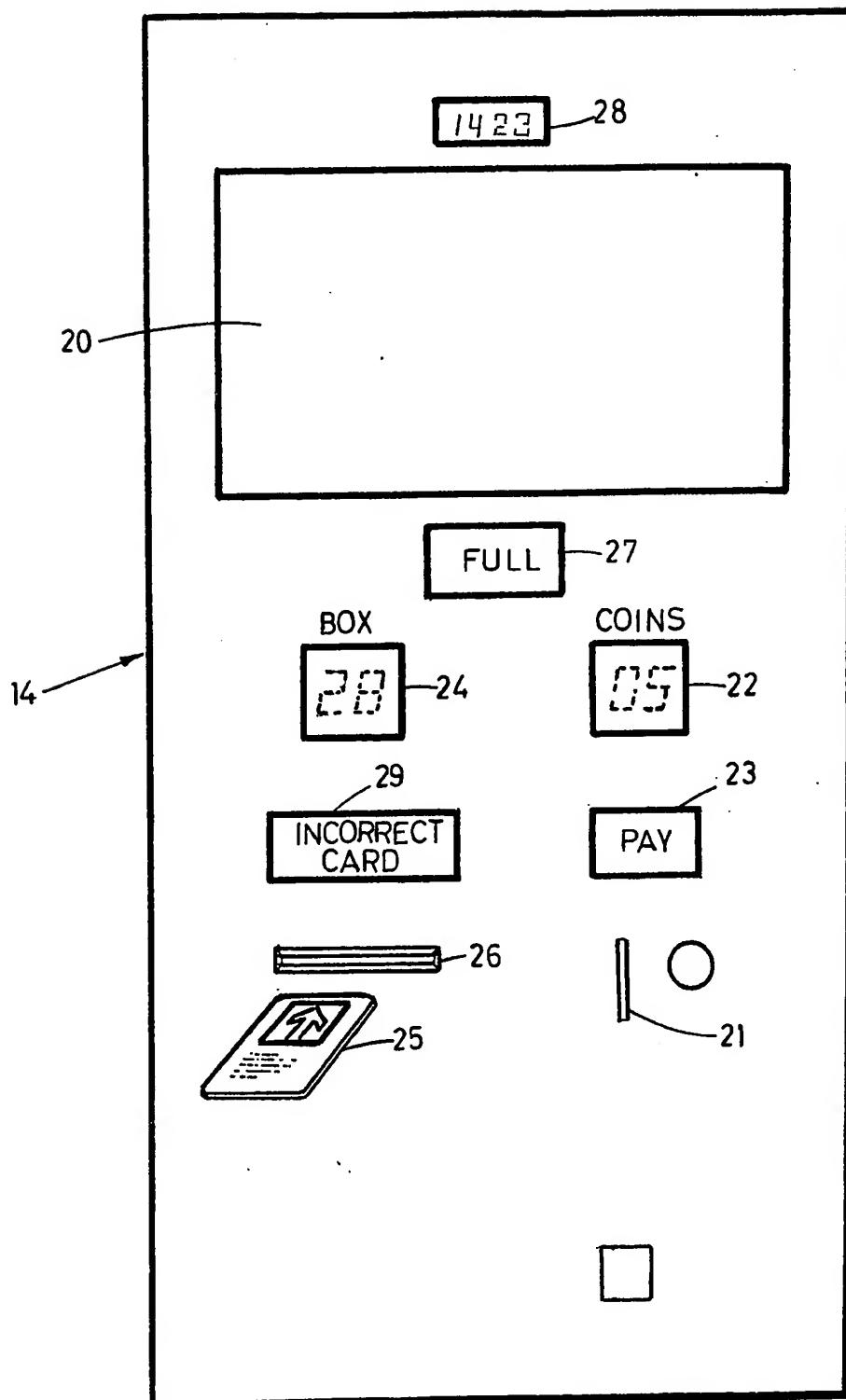
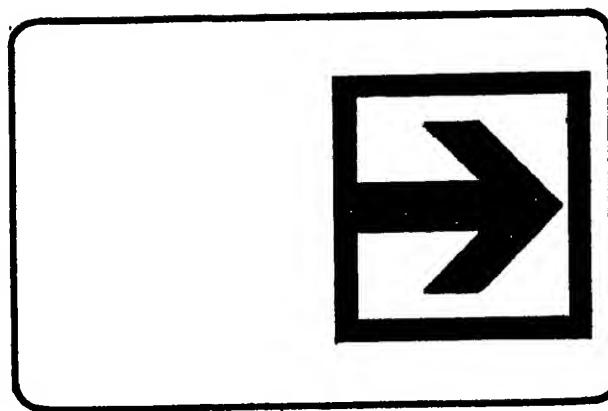


FIG. 2

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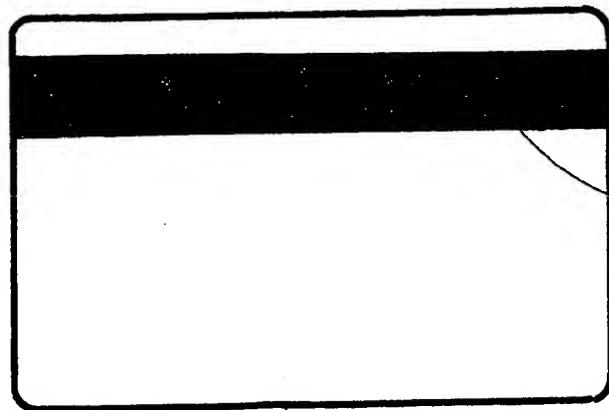
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a

25

FIG. 3



b

30

25

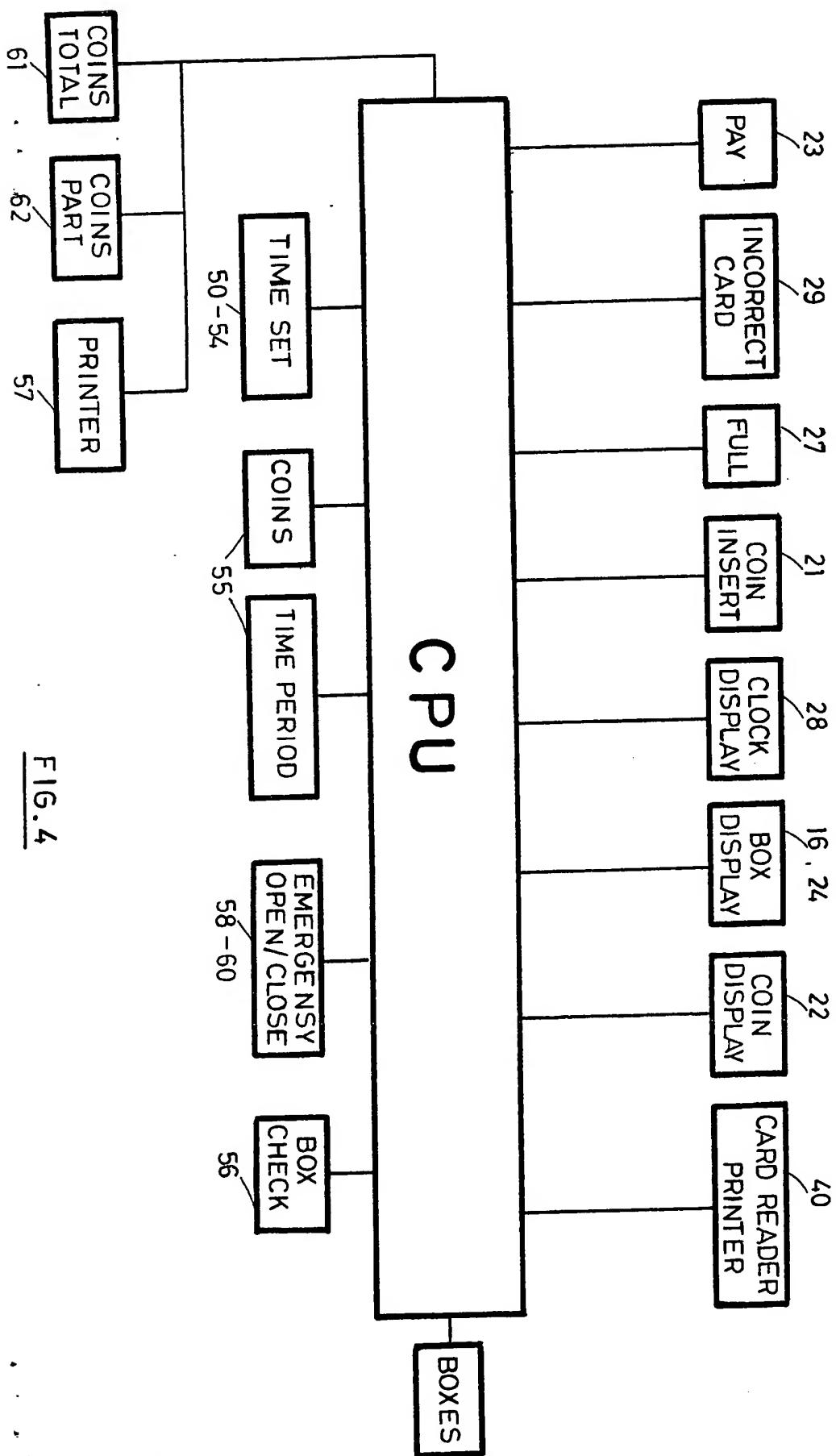


FIG. 4

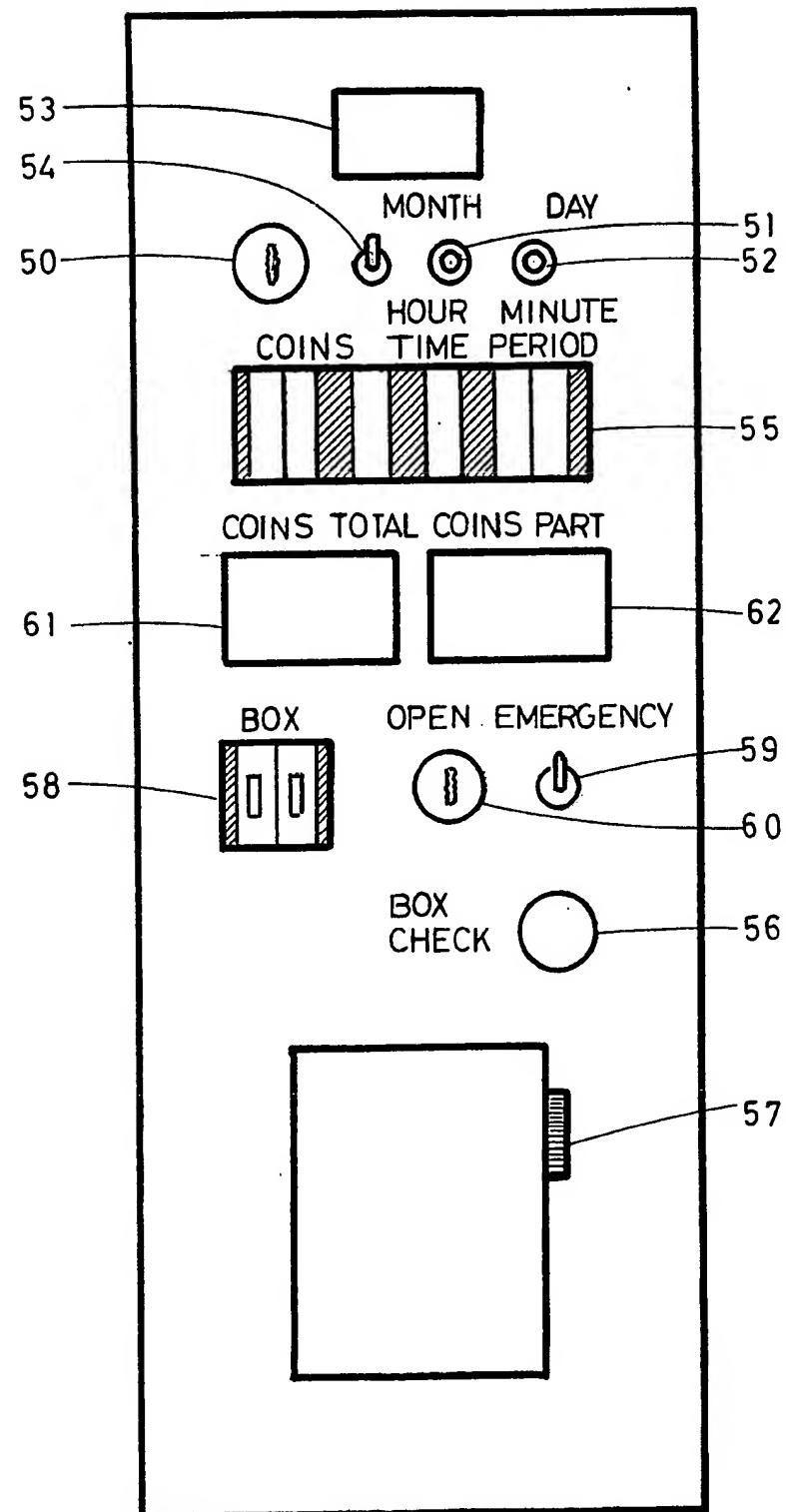


FIG. 5

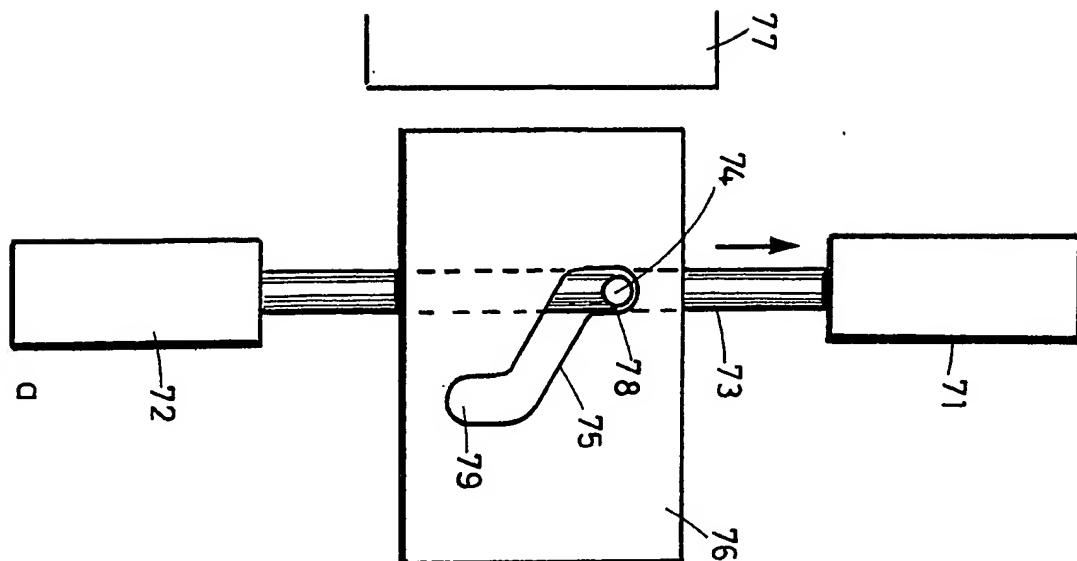
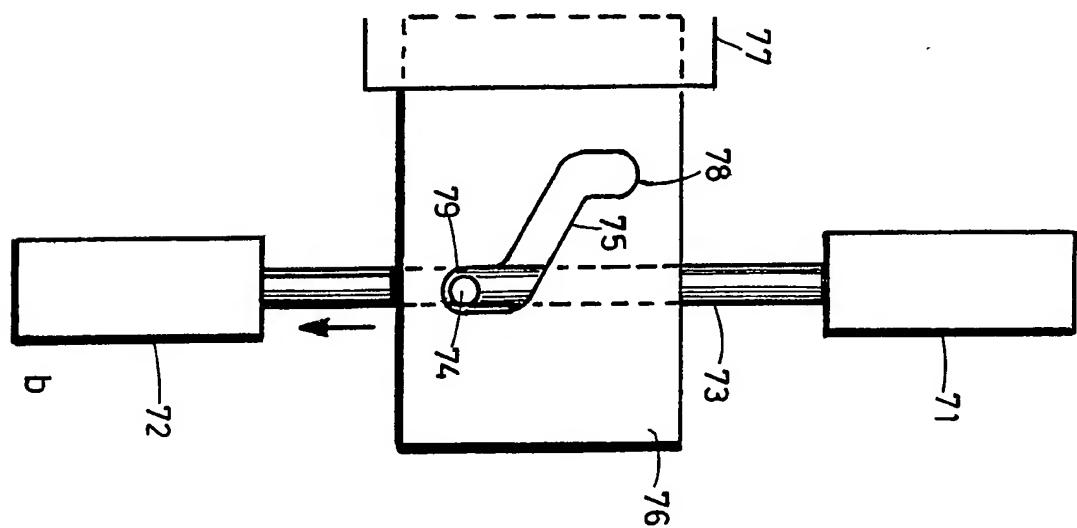


FIG. 6



## SPECIFICATION

## Lock system for storage units

5 The present invention relates to a lock system for storage units, such as boxes and lockers.

Previously known storage systems comprise a set of boxes with individual locks and separate keys for each lock. Furthermore, each box is provided with an 10 individual coin insert. Among other things this has the disadvantage that each time the fee for using the box is changed each coin insert has to be changed in order to accomodate the new fee. Since there are many boxes involved this is a rather time consuming 15 and therefore expensive measure. The disadvantage is made even worse by todays rapid inflation rate, which implies many fee changes.

Another disadvantage with existing systems is that the supervising of the system as regards for 20 instance the status of the individual boxes is also a very time consuming measure, since each box has to be checked separately.

Still another problem with existing systems is that the keys are often lost and can also easily be 25 duplicated or forged.

The present invention aims at eliminating all these and other disadvantages with existing systems and in providing a new improved lock system for storage boxes and lockers in for instance railway stations, 30 underground railway stations, sports facilities and public institutions of various kinds. The system is modular in structure so as to provide complete freedom in choosing the number of storage units and their size.

35 Thus, a principle object of the present invention is to provide a lock system for storage units in which all keys are replaced by a more suitable medium and in which all separate coin inserts are replaced by a single coin insert for all boxes.

40 Another object of the present invention is to provide the system with a central supervising system that on command can report the status of the different boxes.

Still another object of the present invention is to 45 provide a new and improved lock that can be used in the boxes of the present lock system.

A preferred embodiment of the present invention will now be described in detail with reference to the accompanying drawings.

50 In the drawings:

Figure 1 shows a schematic perspective view of the total storage system according to the present invention;

55 Figure 2 shows a front view of the control panel of the system of Figure 1;

Figure 3 shows a plastic card that is to be inserted into the control panel of Figure 2;

60 Figure 4 shows a block diagram of the electronic system in the storage system according to the present invention;

Figure 5 shows a front view of the service panel of the system according to the present invention; and

65 Figure 6 shows the lock according to the present invention suitable for locking the individual boxes.

65 Referring to Figure 1 the storage system 10

comprises a suitable number of boxes 11. The total number of boxes 11 depends on the storing requirements and may be for instance 32, 64, 128 etc. Sofar the system 10 corresponds to existing storage

70 systems. However, instead of providing each box 11 with an individual coin insert and key the boxes 11 in the system 10 according to the present invention are only provided with push-buttons 12. The purpose of these push-buttons 12 will be explained later.

75 Preferably in the middle of the storage system 10 there is provided a section 13 containing the control panel 14 and the service panels. The latter is mounted behind a door 15.

Referring to Figure 2 the control panel 14 is

80 provided with a field 20 containing instructions for the user.

In these instructions the user is asked to pay the prescribed storage fee by inserting a prescribed number of coins (or bank notes) into a coin insert 21.

85 The number of coins to be inserted can be indicated on field 20 and/or on a coin indicator 22 and a pay indicator 23.

After having received the prescribed fee the computer of the system 10 automatically selects a

90 free box and indicates this box on an indicator 24. Simultaneously an indicator lamp 16 (Figure 1) flashes up on the corresponding box, preferably adjacent to the box number N. The indicator lamp 16 is preferably of the blinking type.

95 Also simultaneously with the indication of the free box on indicator 24 an identification card 25 containing all necessary information is output through a slot 26 on control panel 14. This identification card 25 now serves as the user's key.

100 On field 20 the user is instructed to take the card and to put his luggage into the blinking box. The user is then instructed to close the door of the box and to check that the door is closed. Thereafter the user is instructed to push button 12 (Figure 1). The 105 box is now locked.

If there is no free box available at the time when the user arrives this will be indicated by an indicator 27. The user will then have to try another unit 10.

If a free box 11 was available the user is now 110 entitled to use his box for a prescribed period of time, for instance 24 hours. He can check the present time on a clock 28 (Figure 2).

When the user eventually arrives to empty his box he once again enters control panel 14. On the 115 instruction field 20 he is instructed to insert his identification card 25 into slot 26. His box number is indicated by indicator 24 and the lamp 16 (Figure 1) starts to blink on the corresponding box N. The user is then instructed to open his box by pushing the 120 corresponding button 12 (Figure 1).

An important feature of the system is that the card 25 is swallowed by the machine simultaneously with the identification. The card is then stored by the machine and can later be used again by another 125 user. Preferably a larger number of cards than the number of available boxes is stored in the system to account for card-losses. In that way there will always be a card available for each box.

In case an incorrect or defect card 25 is inserted

130 into slot 26 this will be indicated on an indicator 29.

The type of cards that are used in the system and their identification and encoding will be described below.

The above description relates to the situation in 5 which the user has returned within the prescribed period of time (24 hours). If the prescribed period of time has been exceeded the user still inserts his identification card 25 into slot 26. In this case, however, the user will have to pay another fee 10 before he can open his box. The fee to be paid is indicated by indicator 22 and indicator 23 will flash up to instruct the user to pay this fee. When the fee has been paid the user can open his box by pushing button 12 (Figure 1) as before. Thus the prescribed 15 period of time has been paid in advance, while the exceeding period of time can be paid when the user returns.

The operation of the system will now be described more in detail with reference to Figures 3 and 4. 20 Figure 3 shows the identification card 25 from both sides. Figure 3a shows the upper side of the card. Figure 3b shows the other side of the card. The card is preferably a plastic card provided with a magnetic strip 30. This strip 30 can be used to provide the card 25 with an identification code to make the card function as a key.

When the user reaches control panel 14 (Figure 2) he is instructed to pay the prescribed fee. The amount to be paid is indicated by display 22 and 30 display 23 instructs the user to pay this fee.

The user starts to insert coins into coin insert 21. Each inserted coin activates a counter in the central processing unit CPU (Figure 4). This unit lowers the indication of display 23 with one unit for each 35 inserted coin. When the display reaches zero indicator 23 is turned off and this starts the generation of a code on an identification card 25. All cards are stored in a card stack and one card is now brought to a card reader/printer 40 (Figure 4). The printer generates a 40 code on the magnetic strip 30 (Figure 3b). This code preferably contains the following information:

1) A box number indicating the box to be used. This box number is chosen by a random member generator in the central processing unit. After the 45 random member has been generated the central processing unit checks whether this box number is free or not. If the box is free the box number is printed on the magnetic strip 30.  
2) A special code for the present user. This code 50 can also be generated by a random member generator.  
3) A code that identifies the unit 10 (Figure 1). The code can for instance contain an identification of the station where the unit is positioned, and if this 55 station contains several units, the identification of the present unit. The date and time when the prescribed fee has been paid.

After the magnetic strip 30 has been provided with this information the card 25 is given to the user 60 through slot 26 (Figure 2). Display 24 is activated by the central processing unit and shows the user which box number N he has been assigned. Lamp 16 of the corresponding box is blinking. The central processing unit has also opened the electronic lock 65 of the box. The user can open the door of the box

and store his luggage in it. When the user has closed the door he pushes button 12 and this activates the central processing unit to lock the electronic lock of the box. The user can now leave the station with the 70 luggage safely stored.

To eliminate mistakes the system is preferably provided with an electronic circuit that senses the opening of the box door and that prevents locking of the electronic lock before the box door has been 75 both opened and closed. Thus, if the user by mistake pushes bottom 12 before he has opened the box door no locking will occur.

The central processing unit preferably continuously checks the status of the boxes of the system. If all the 80 boxes are full this will be indicated by display 27 (Figure 2). If the user now tries to obtain a free box by inserting coins into coin insert 21 the system is blocked and will return the coins to him. Instruction field 20 (Figure 2) will instruct him to try another 85 system 10.

When the user returns to the system he is instructed to insert his identification card into the slot 26. The card is identified by card reader 40 and if the card is approved it is swallowed by the system 90 and returned to the card stack for later use. If the card is not correct this will be indicated by display 29. In this case the system is blocked and the user cannot open any box.

If the card is approved the number N of the user's 95 box will be indicated in display 24. Thus, the user does not have to remember the number of this box. Lamp 16 of the corresponding box is also blinking. The user can open the box by pushing button 12. This opens the electronic lock and after the user has 100 taken out his luggage the box is free again.

The card that has been accepted by the system and is now lying in the card stack again still has its code on its magnetic strip 30. However, the code no longer has any meaning to the system and the card 105 will receive a new code the next time it is assigned to another user. Thus, the cards can be said to be similar to a key. Unlike keys, however, they cannot be forged. Furthermore, if a card is lost an operator can immediately program the system not to accept the 110 lost card in order to avoid unauthorized opening of the boxes.

Sofar only the part of the system that is accessible to the user has been described. The part of the 115 system that is accessible to the key operator will now be described with reference to Figures 4 and 5.

The key operator has access to the service panel (Figure 5) behind service door 15 (Figure 1).

The time is set by operating key switch 50 and by 120 pressing switches 51 and 52 until the correct time is displayed on display 53. This is done in two steps. In the first step switch 54 is in the upper position in which the month and the day are set by switches 51, 52. Switch 54 is then turned to the lower position, in which the hour and minute are set on the same 125 switches 51, 52.

The number of coins per time period and the maximum allowable time period are set on a set of thumb wheel switches 55. This means that if the fee for using a box for a prescribed time period changes 130 this change can be programmed into the whole

system by changing the thumb wheel corresponding to the number of coins per time period. Thus, if the present fee is three coins per 24 hours and this fee should be changed into four coins per 24 hours it is only necessary to change the thumb wheel "coins" from three to four. This will give the correct fee for every box in the system. In the same way the maximum allowable storing time can be preset.

For instance once every day the key operator goes to the service panel and pushes button 56, which is a box check switch. When this switch has been pushed the central processing unit checks which of the boxes that have exceeded the maximum allowable storing time set by thumb wheels 55. The corresponding box numbers are listed by a printer 57. In this way the key operator immediately gets a list of the boxes that should be opened and emptied.

This is done by choosing the box to be opened on thumb wheel switch 58 and positioning emergency switch 59 into position "open". Thereafter key switch 60 is operated. After pressing button 12 on the corresponding box it is now possible to open the box door. Thereafter this box is free. The same procedure is repeated for the remaining boxes on the list. The contents of these boxes is then transferred to a special department where the user can get it back by showing his identification card 25 and paying a prescribed fee.

The same emergency opening procedure can be performed by the key operator in case the user has lost his card or when the card has some defect and has not been accepted by the machine.

A lost card 25 that has been found by another person or a card with a defect (code defect or maximum allowable storing time exceeded) can be checked by the key operator with a special check unit. The check unit displays the date and the time for the start of the storing and the box number and station code, if these data are still readable. Thus, the key operator can check the status of the card with the check unit and can with a check list decide whether the goods has been taken care of or not.

If emergency switch 59 is switched to the lower position it is possible to perform an emergency closing in the same way as the emergency opening. This makes it possible for the key operator to open and close a box when a user has lost his card to check whether the particular box is the user's box or not. If the box happens to be the wrong one the operator can close it again with the emergency switch without affecting the storing function performed by the central processing unit. Thus, for instance the time counting continues as if nothing had happened.

The service panel also contains two indicators 61, 62 displaying the number of coins inserted into the machine.

Display 61 shows the total number of coins that has been inserted into the machine since it has been installed. This display is not resettable. The second display 62 shows the number of coins inserted into the machine since the coin box has been emptied. This display is resettable and is preferably reset every time the coin box is emptied.

As has been mentioned before the lock system of

the present invention comprises an electronic lock system. Each box can be provided with a lock operating as the lock of Figure 5.

Figure 5a shows the lock in its opened position. Figure 5b shows the lock in its closed position. Two relays 71, 72 are interconnected with a rod 73. The rod 73 is provided with a pin 74 than fits into a slot 75 of a locking plate 76. These elements are preferably mounted on the casing of the box, while a locking cam 77 is mounted on the box door.

When the box is unlocked as in Figure 5a the locking plate 76 is positioned adjacent to but free from the locking cam 77. When the box is locked as in Figure 5b the locking plate 76 extends behind the locking cam 77 thereby locking the box.

When the box is unlocked by pressing button 12 (Figure 1) relay 71 is activated to move rod 73 upwards as indicated by the arrow in Figure 5a. Pin 74 thereby moves through slot 75 which moves the locking plate 76 to the right free from the locking cam 77.

When the box is locked by pressing button 12 relay 72 moves rod 73 downwards in the direction of the arrow in Figure 5b. Thereby pin 74 moves through slot 75 thereby forcing locking plate 76 to the left in Figure 5b behind locking cam 77. This locks the box.

As can be seen from Figure 5 slot 75 contains two cam portions 78, 79, thus, when pin 74 has reached one of the end positions in the slot plate 76 is locked against movement in the horizontal direction since pin 74 is locked behind one of cam portions 78 and 79, respectively. This means that once one of the relays 71, 72 has shifted locking plate 76 from one end position to the other it is no longer necessary to have the relay activated. Thus, only the shifting of the lock has to be done electronically. When the locking position has been reached the locking function is performed mechanically without the need of further activation of the relays. This means that the lock system of the present invention needs very little energy. The only time when the lock needs energy is when the box is closed or opened, which occurs rather seldom.

In summary the present invention provides a new system with the following features:

1) A forgery proof data card replaces the usual keys that can be lost or forged.  
2) A very rational coin handling - only one coin container has to be emptied.

3) Programmable storage time.  
4) Programmable storage free. Free changes have to be programmed only once for the whole system.

5) Printer for recording and statistics.  
6) Simpler service supplied centrally from the central processing unit.

It will be appreciated from the foregoing that the present invention represents a significant advance in the field of locker systems. It will also be appreciated that, although a specific embodiment of the invention has been described in detail for purpose of illustration, various modifications may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.

## CLAIMS

1. Storage system with several storage units such as boxes or lockers, *characterized* in an electro-  
5 nic lock system wherein each box has an individual electronic lock and all the locks are controlled by a central processing unit.
2. The storage system of claim 1, wherein the central processing unit comprises a micro processor.
- 10 3. The storage system of claim 1, comprising a single coin insert common to all the boxes and controlled by the central processing unit.
- 15 4. The storage system of claim 1, wherein one of a set of data cards is assigned a certain box and a certain user on payment of a prescribed fee, and wherein this card can be used to open said box over said central processing unit.
- 20 5. The storage system of claim 4, comprising a single card insert common to all the boxes and controlled by the central processing unit.
6. The storage system of claim 4, wherein the card is returned to said set when the user returns to get his luggage back.
- 25 7. An electronic lock, comprising two mechanically interconnected relays for switching the lock from its open to its locked position and from its locked to its open position, respectively, and mechanical means for holding the lock in either of these positions.
- 30 8. The lock of claim 7, wherein said mechanical means comprises a plate with an S-shaped slot.
9. A storage system substantially as hereinbefore described with reference to the accompanying drawings.
- 35 10. An electronic lock substantially as hereinbefore described with reference to the accompanying drawings.

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